

**REMARKS**

This amendment after Final is in response to a Final Office action (Paper No. 8) mailed March 25, 2003. Upon entry of this amendment, claims 1-5, 7 and 9-34 will be pending in this application. Applicant has amended claims 1, 5, 17, 20, 22 and 23 by this amendment and has newly added claims 24-34 by this amendment.

Applicant has amended claims 1, 5, 17, 20, 22 and 23 by this amendment only and solely to correct for errors in the claims and not to change the scope of the claims or to enter new matter.

Applicant also has amended FIG. 3 by this amendment to correct for an error. The beam spanning an angle of about 10 degrees that emerges from lens 310 is not sorted according to wavelength. It is the etalon 320 that separates the WDM optical beam into spectral components. The lens 310 does not separate the WDM beam into spectral components.

In Paper No. 8, the Examiner objected to the drawings. Applicant has amended FIGS. 2 and 3 by this amendment making these objections moot.

In Paper No. 8, the Examiner has finally rejected claims 1, 4, 5, 9, 11 and 13 under 35 U.S.C. 103 (a) as being unpatentable over Johnson *et al.*, U.S. Patent No. 5,481,183. Applicant traverses this rejection because the apparatus and the etalon used in Johnson '183 cannot separate

optical channels of a WDM signal. Applicant claims in claims 1, 4 and 5 an optical channel monitoring apparatus that separates WDM optical signals. If a WDM optical signal was to impinge on the apparatus of Johnson '183, the WDM optical signal would not be separated according to channels. This is because Johnson '183 seeks to separate a microwave signal modulated on a monochromatic laser optical signal. Therefore, the apparatus of Johnson has a resolution of 0.0004 nm in order to monitor the microwave signal and not channels of a WDM signal. In contrast, Applicant's apparatus has a resolution of 0.8 nm, which is the typical wavelength separation for channels in a WDM optical signal. Because the apparatus of Johnson '183 is looking for wavelength differences of about 0.001 nm, if channels of a WDM optical signal were to impinge on the apparatus of Johnson '183, the channels would not be separated. Therefore, Johnson '183 fails to teach or suggest the WDM channel monitoring apparatus of Applicant's claims 1, 4 and 5.

Applicant will now explain in detail why the Apparatus of Johnson '183 does not meet Applicant's claims and why Johnson '183 is unrelated to Applicant's invention:

### **1. General Discussion of Applicant's contribution to the art**

Applicant's invention pertains to a method and an apparatus that analyzes the spectral components (or channels) of a wavelength division multiplexed (WDM) optical signal beam typically found in optical fibers. The WDM beam leaving the fiber is first collimated. The collimated beam illuminates a lens that spreads the once collimated beam into a range of angles.

This beam spanning a range of angles impinges on a Fabry-Perot etalon. The etalon separates the spanned beam by wavelength or spectral component. The etalon transmits light of a certain wavelength, the transmitted wavelength being dependent upon the incident angle of the light onto the etalon. An array of detectors are positionally disposed at the output side of the etalon. Each detector in the array receives light of a particular wavelength. Each detector converts the received light into electrical signals that are sent to the microprocessor. The microprocessor is programmed and configured to calculate the intensity of each spectral component and the signal to noise ratio of the WDM beam emerging from the optical fiber. Applicant's apparatus is geared for WDM beams having spectral components typical for data transmission in an optical fiber.

## **2. Discussion of Johnson '183**

Johnson '183 seeks to analyze the spectral components of an RF or microwave signal. Johnson '183 modulates an RF or microwave signal with a monochromatic laser beam. The modulated beam goes through a lens, then an etalon, and then a pixel array to a display so that the spectral components of the RF or microwave signal, and not the monochromatic laser signal, can be viewed.

## **3. Discussion of differences between Applicant's Invention and Johnson '183**

Applicant analyzes the spectral components of a WDM optical signal found in an optical fiber. Johnson '183 analyzes the spectral components of an RF or microwave signal and not an

optical signal. This difference is critical as Applicant claims a WDM optical signal is split and analyzed while Johnson '183 analyzes only an RF or microwave signal that is not found in optical fibers.

Because Johnson '183 analyzes the spectral components of an RF or microwave signal and Applicant analyzes the spectral components of a WDM optical signal, the following structural differences are clear. The lens in Johnson '183 creates a beam spanning 0.715 degrees while Applicant's lens creates a beam spanning over 10 degrees. Further, the construction of the etalon used in Johnson '183 is entirely different than the etalon used in Applicant's invention for the following reasons: 1) Applicant's etalon has a thickness of 28.6 microns and Johnson '183 teaches etalon 13 as having a thickness of 8mm, about a 1000:1 difference, 2) the free spectral range (FSR) of Applicant's etalon is 30 nm while the FSR of etalon 13 in Johnson is 0.02871 nm, again a 1000:1 difference, 3) the range of angle of incident light is over 10 degrees in Applicant's invention while the range of incident radiation in Johnson is less than one degree, 4) the finesse (or fineness) of Applicant's etalon is 300 while the finesse of the etalon in Johnson is 75 and 5) the resolution of Applicant's etalon is 0.1 nm while the resolution of the Johnson '183 etalon is 0.000383 nm, another 1000:1 difference. The reason for these gross structural differences is that Johnson modulates RF microwave signals with laser light and then measures the spectral components of the RF or microwave signals. Therefore, Johnson '183 is looking for extremely minute differences in wavelength in beam 12 entering etalon 13. These minute differences in wavelength are between 0.0004 nm and 0.0287 nm. Such small differences in

wavelength are often not present or are not of concern for WDM signals that travel in an optical fiber and carry data. This is why Applicant's invention and Applicant's claims cannot be taught or suggested by Johnson '183.

**4. How FSR and resolution in nm above of etalon 13 in Johnson '183 are calculated**

In order to aid the Examiner in arriving the above numbers in nm for FRS and resolution of the etalon 13 in Johnson '183, Applicant is providing the following explanation. Finesse = FSR/resolution. However, Johnson states the FSR and resolution in Hertz, not in a unit of length such as nm. Applicant will now explain how the above numbers for resolution and FRS in nm for etalon 13 in Johnson '183 are arrived at. In Johnson '183, the finesse is 75, the resolution is 166.7 MHz and the FSR is 12.5 GHz. The laser light in Johnson '183 has a frequency of  $361.4 \times 10^{12}$  Hz. To calculate resolution of etalon 13 in Johnson '183, calculate the wavelength of  $361.4 \times 10^{12}$  Hz light. Then calculate the wavelength of light having a frequency of  $(361.4 \times 10^{12} + 166.7 \times 10^6)$  Hz and find the difference in wavelengths. This difference in wavelengths should be 0.00038289 nm which is the resolution of etalon 13 of Johnson '183. To calculate FSR of etalon 13 of Johnson '183, calculate the wavelength of  $361.4 \times 10^{12}$  Hz light. Then calculate the wavelength of light having a frequency of  $(361.4 \times 10^{12} + 12.5 \times 10^9)$  Hz and find the difference in wavelengths. This difference in wavelengths should be 0.02871 nm which is the FSR of etalon 13 of Johnson '183.

### **5. Discussion of the Rejected Claims**

Regarding Applicant's claims 1, 4 and 5, Applicant claims an apparatus that monitors channels in a WDM optical signal. The channels in WDM optical signals are ordinarily separated from each other by about one nanometer. In Johnson, the etalon 13 has a FSR of less than 0.03 nm. Because the typical wavelength separation between channels in a WDM signal (about one nanometer) is larger than the FSR of etalon 13 of Johnson '183 (0.03 nm), Applicant submits that optical channels in a typical WDM optical signal would not at all be separated by the apparatus of Johnson '183. This is because the different channels in a WDM optical signal differ in wavelength by much more than the 0.03 nm that the etalon 13 of Johnson '183 is capable of processing. As is illustrated in Applicant's Table 1, the channels are separated by about 0.8 nm. Therefore, if Applicant's WDM optical signal impinged on Johnson's etalon, there would be no separation of optical channels because the FSR of Johnson's etalon is 0.03 nm which is less than the 0.8 nm difference in wavelength between optical channels in a WDM optical signal. Therefore, Applicant submits that the etalon of Johnson '183 cannot be used to separate Applicant's WDM signal. Therefore, the rejection to Applicant's claims 1, 4 and 5 must be withdrawn.

Regarding claim 9, Applicant claims that the lens 310 produces a beam spanning a range of angles of about 10 degrees. On page 4 of Paper No. 8, the Examiner asserts that Johnson '183 teaches a -36 to +36 degrees span. Applicant disagrees. Column 3, line 25 of Johnson '183 states - 0.36 to +0.36 degrees, not -36.0 to + 36.0 degrees. This is an error of a magnitude of  $10^2$

or 100. Johnson teaches a range of angles of 0.715 degrees, not 10 degrees as claimed by Applicant in claim 9.

**6. Showing of Good and Sufficient Reason for entry of claims 24-34**

**as per 37 C.F.R. 1.116 (c)**

Applicant submits that entry of new claims 24-34 after final should be entered for the following reasons. In this amendment, Applicant is responding to newly cited Johnson '183. Applicant never had an opportunity to address Johnson '183 at any time earlier in the prosecution of this instant patent application. Furthermore, Applicant submits that Johnson '183 was never part of the file wrapper of Applicant's patent application until the issuing of the final Office action (Paper No. 8). Therefore, Applicant never had an opportunity to respond to Johnson '183 as Johnson '183 was newly cited in a PTO-892 in Paper No. 8, not in Paper No. 5. Furthermore, Applicant submits that Johnson '183 should have been part of the file wrapper in Paper No. 5, the first Office action if Johnson '183 was so pertinent to Applicant's invention and Applicant's claims. Since Johnson '183 is deemed pertinent to Applicant's invention and Applicant's claims, and since Johnson '183 was not found by the Examiner and placed in the file wrapper and on a PTO-892 form with the first Office action of Paper No. 5, Applicant requests, in the name of fairness to the Applicant, in the name of compact prosecution and in the name of good customer service that Applicant's newly presented claims 24-34 be entered.

**7. 37 C.F.R. 1.111 (c) explanation of newly added claims**

Applicant is newly adding claims 24-34 by this amendment. These claims claim features pertaining to Applicant's etalon that are logarithmically different from the specifications of etalon 13 of Johnson '183, such as the FSR, resolution, thickness, finesse and range of incident angles of Applicant's etalon. Applicant's claimed etalon is 28 microns thick while the thickness of etalon 13 of Johnson '183 is 8mm. Applicant's claimed etalon has a FSR of 30 nm while the FSR of etalon 13 of Johnson '183 is 0.028nm. Applicant claims that the optical signal impinging on Applicant's etalon spans a range of angles of at least 10 degrees while the signal of Johnson '183 spans less than one degree. Each of these specifications of Applicant's etalon are vastly different and thus unrelated to the specifications of etalon 13 in Johnson '183.

A fee of \$282 is incurred by the addition of one (1) independent more claim in excess of 3 and eleven (11) more claims in excess of 20. Applicant's check drawn to the order of Commissioner accompanies this Response. Should the check become lost, be deficient in payment, or should other fees be incurred, the Commissioner is authorized to charge Deposit Account No. 02-4943 of Applicant's undersigned attorney in the amount of such fees.



In view of the above, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Reconsideration of the rejections and objections is requested. Should any questions remain unresolved, the Examiner is requested to telephone Applicant's attorney.

Respectfully submitted,



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FIG. 1

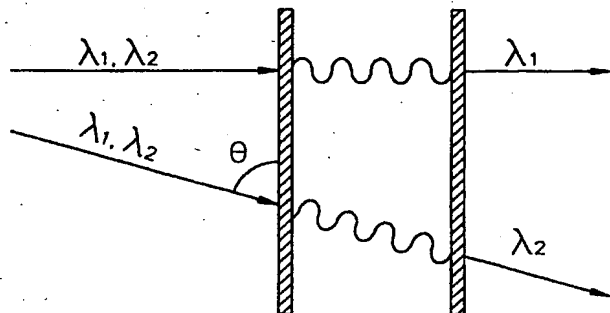


FIG. 2

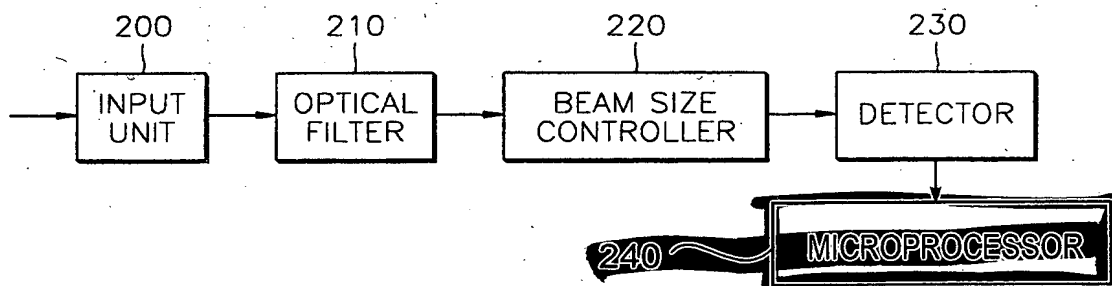


FIG. 3

